# Advanced Airway Techniques



### Introduction

- One of the most critical skills for the soldier medic.
- Without proper airway management and ventilation techniques, casualties may die.
- Must be able to choose and effectively utilize the proper equipment for ventilation in a tactical environment.

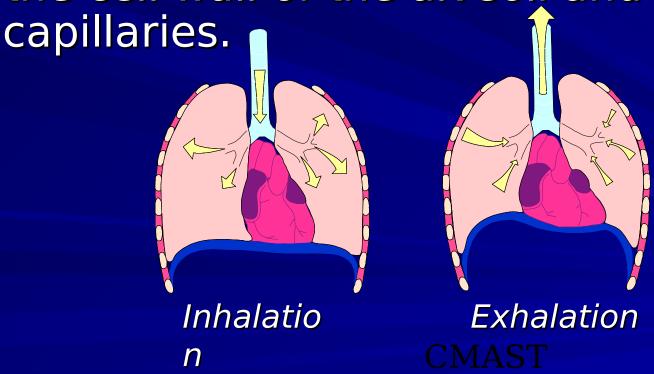
### Review the Physiology

- Inhalation (an active process):
  - Initiated by contracting of respiratory system muscles
  - Diaphragm contracts and drops downward
  - Intercostal muscles contract, chest expands
  - Intrathoracic pressure falls, pulling air into lungs
- Exhalation (a passive process):
  - Respiratory muscles relax; diaphragm moves upward
  - Chest wall recoils
  - Intrathoracic pressure rises
  - Air is pushed out

### Gas Exchange

Alveoli supply O<sup>2</sup> to, and remove CO<sup>2</sup> from the lungs.

 Exchange is made by diffusion across the cell wall of the alveoli and



# Sources of Airway Obstruction

- Tongue:
  - Most common cause of airway obstruction
- Foreign body airway obstruction (FBAO).
- Trauma/Combat:
  - Loose teeth, facial bone fractures, fractured larynx
- Laryngeal spasm:
  - Edema can severely obstruct airflow
- Aspiration.

# Nasopharyngeal Airway

Insert a nasopharyngeal airway (NPA) adjunct.



 Do not use if roof of mouth is fractured or brain matter is exposed.

#### Purpose:

 To maintain an artificial airway for oxygen therapy or airway management

#### • Indications:

- Conscious, semi-conscious or has an active gag reflex
- Injuries to mouth
- Seizure casualties
- Likely vomiting

- Contraindications:
  - Injuries to roof of mouth
  - Exposed brain matter
  - Drainage of CSF from nose, mouth or ears

- Complications:
  - Nasal trauma
  - Bloody nose, minor tissue trauma (most common)
  - May trigger gag reflex if NPA is too long



- Procedures:
  - Supine position on firm surface C-spine stabilized
  - Select proper size NPA
    - Diameter smaller than the casualty's nostril; approximately diameter of casualty's little finger
    - Length Measure from tip of nose to earlobe

Procedures:

- Lubricate the NPA with a water soluble

**lubricant** 



Procedures:

- Place head into a neutral position;

extend nos



Procedures:

- Insert tip of the NPA through the R

nostril; if resistance is mot

the other nostril

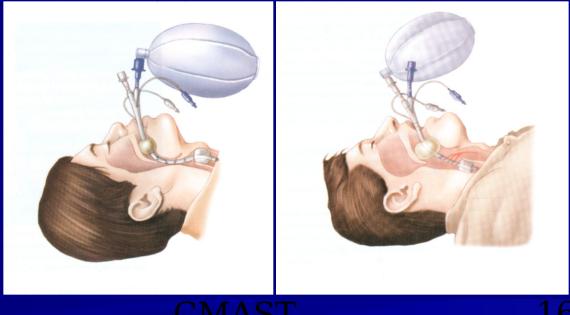
Place casualtyIn recoveryposition



- Esophageal-tracheal double lumen airway.
- Blind insertion.
- Successful in casualties with
  - Trauma
  - Upper airway bleeding and vomiting
- Effective in cardiopulmonary resuscitation.



- Double-lumen design allows for effective ventilations regardless if in the trachea or esophagus.
- Comes in two sizes:
  - 37 Fr
  - 41 Fr



- Indications:
  - Adult casualties in respiratory distress
  - Adult casualties in cardiac arrest
- Contraindications:
  - Intact gag reflex
  - Casualties less than 5 feet in height
  - Known esophageal disease
  - Caustic substance ingestion

- Side effects and complications:
  - Sore throat
  - Dysphagia
  - Upper airway hematoma
- Esophageal rupture (rare).
- Preventable by avoiding overinflation of the distal and proximal cuffs.

- Intubation procedures:
  - Inspect the upper airway for visible obstructions
  - Hyperventilate (> 20/min) for 30 seconds

Casualty in neutral head position

- Test both cuffs:
  - 15 ml (white)
  - 100 ml (blue)



- Intubation procedures:
  - Insert in same direction as the natural curvature of the pharynx
    - Grasp tongue and lower jaw between thumb and index finger, lift upward (jaw-lift)
    - Insert gently but firmly until black rings are positioned between casualty's teeth
    - Do not force if does not insert easily, withdraw and retry
    - Hyperventilate between attempts

- Intubation procedures:
  - Inflate #1 (blue) pilot balloon with <u>100 ml</u> of air (100 ml syringe)
  - Inflate #2 (white) pilot balloon with <u>15 ml</u> of air (20 ml syringe)
  - Ventilate through the primary #1 blue tube; if auscultation of breats is positive (gains is negation continue to ventilate

- Intubation procedures:
  - If auscultation of breath sounds is negative and gastric sounds is positive, immediately begin ventilations through the shorter (white) connecting tube (#2)
  - Confirm tracheal ventilation of breath so
    - absence gastric insufflation

#### Intubation procedures:

- If auscultation of breath sounds and auscultation of gastric insufflation is negative, the Combitube® may have been advanced too far into the pharynx
- Deflate the #1 balloon/cuff, and move the Combitube® approx. 2-3 cm. out of the casualty's mouth
- Re-inflate the #1 balloon and ventilate through the longer (#1) connecting tube; if auscultation of breath sounds is positive and auscultation of gastric insufflation is negative - continue to ventilate.
- If breath sounds are still absent extubate

- Combitube removal.
- Should not be removed unless:
  - Tube placement cannot be determined
  - Casualty no longer tolerates the tube
  - Casualty vomits past either distal or pharyngeal tube
  - Palpable pulse and casualty breathing on their own
  - Physician or PA is present to emplace ETT

- Combitube removal.
  - Have suction available and ready
  - Logroll casualty to side (unless spinalinjured)
  - Deflate the pharyngeal cuff (#1 pilot balloon)
  - Deflate the distal cuff (#2 pilot balloon)
  - Gently remove Combitube® while suctioning

- Indications:
  - Inability to ventilate a casualty with NPA or Combitube secondary to:
    - Severe maxillofacial injury, airway obstruction and structural deformities
    - Emergency airway catheters with a 6 mm diameter allow for spontaneous breathing and adequate oxygenation in adults

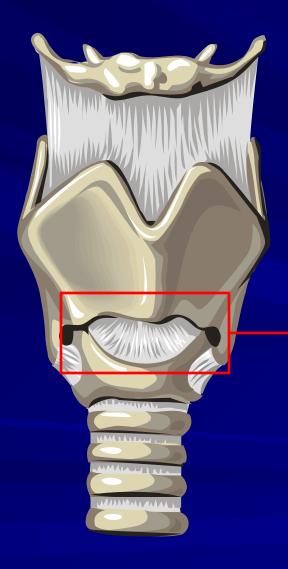
When maxillofacial, cervical spine, head or soft tissue injuries are present, several factors may prevent ventilation:

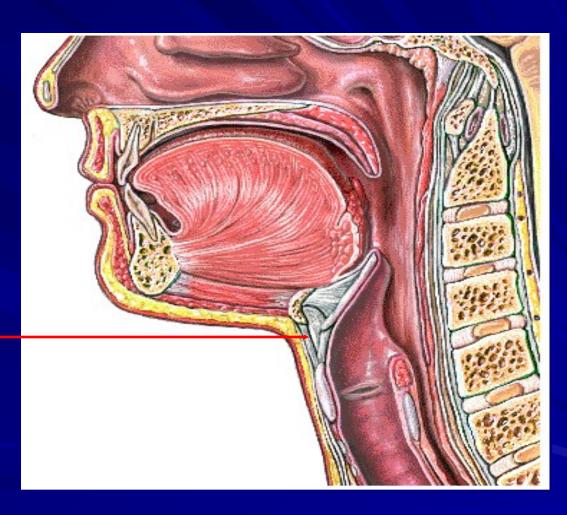
- Gross distortion
- Airway obstruction
- Massive emesis
- Significant hemorrhag



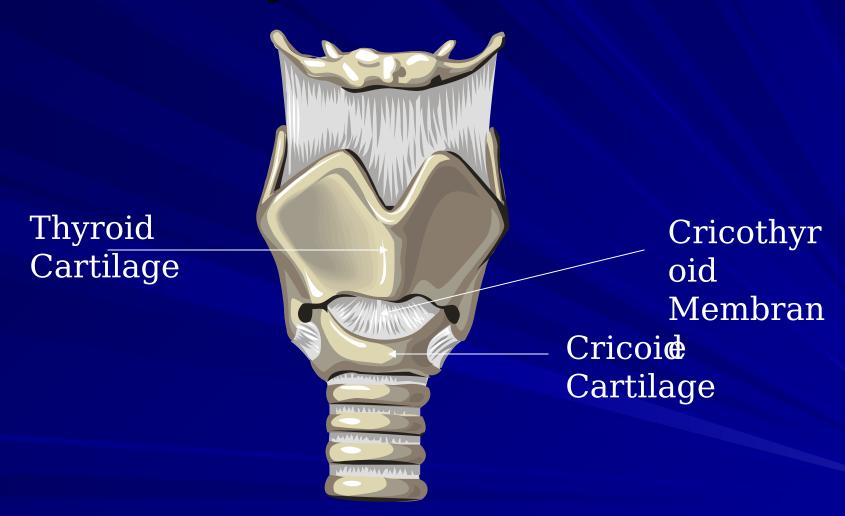
- Complications:
  - Incorrect tube placement
  - Blood aspiration
  - Esophageal laceration
  - Hematoma
  - Tracheal wall perforation
  - Vocal cord paralysis, hoarseness

# Larynx



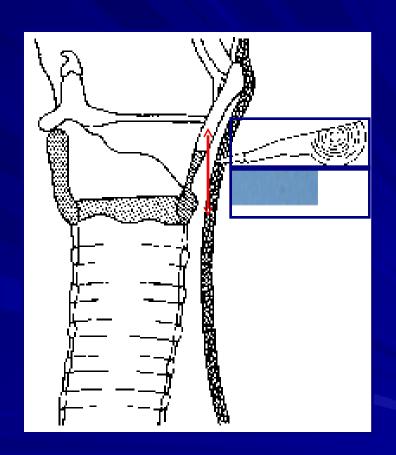


# Cricothyroid Membrane



#### Procedure:

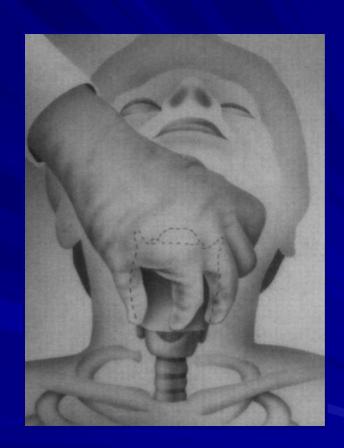
- Identify and palpate the cricothyroid membrane
- Make a 1 ½-inch
   vertical incision in
   the midline using a
   #15 or #10 scalpel
   blade



#### Procedure:

 Stabilize the larynx with one hand; using a scalpel or hemostat, cut or poke through the cricothyroid membrane

A rush of air may be felt through the opening





- Insert the end of the ET tube into the trachea directed towards the lungs and inflate the cuff with 5-10 ml of air
- Advance the tube no more than 2-3 inches; further intubation could result in right main stem broncus inubation only



- Check for air exchange and tube placement:
  - Listen and feel for air passing in and out of tube
  - Look for bilateral rise and fall of the chest
  - Ascultate the abdomen and both lung fields

- Indications of proper placement:
  - Unilateral breath sounds and rise and fall of the chest (right main stem intubation); deflate cuff and retract
     1-2 inches and recheck airway
  - Air coming out of the casualty's mouth (tube pointing away from lungs); remove tube and reinsert with tube facing lungs

- If casualty is not breathing spontaneously direct someone to perform rescue breathing:
  - Connect tube to BVM and ventilate at 20 breaths per minute
  - No BVM available, perform mouth-totube resuscitation at 20 breaths per minute
  - Tube must be secured once rescue breathing has started

- Apply dressing to protect the tube and incision site:
  - Cut two 4x4 gauze sponges halfway through and place on opposite sides of tube; tape securely
  - Or apply two 4x4 gauze dressing in a "V" shape fold at the edges of the cannula and tape securely

- Monitor casualty's respirations on a regular basis.
  - Reassess air exchange and tube placement every time the casualty is moved
  - Assist with respirations if rate falls below
     10 or above 24 per minute



### Summary

- Airway compromise is a small percentage of combat casualties.
- Airway management must be readily available and rapidly applied.
- Airway compromise is the third leading cause of preventable death on the battlefield.

# Questions?

